REMARKS

This application has been reviewed in light of the Office Action dated July 17, 2002. Claims 1-17, 19-22, 25, and 26 are pending in this application and have been amended to define more clearly what Applicants regard as their invention. Applicants note that the changes to Claims 2-16, 20, 22, 25, and 26 affect matters of form only and do not, in any way, narrow the scope of any of these claims. Claim 18 has been canceled and the allowable subject matter from Claim 18 has been incorporated into Claim 17. Non-elected Claims 23 and 24 have been cancelled, without prejudice or disclaimer of the subject matter presented therein. Claims 1, 17, 19, and 21 are in independent form. Favorable reconsideration is requested.

First, Applicants gratefully acknowledge the indication that Claim 18 includes allowable subject matter and would be allowable if rewritten in proper independent form. As mentioned above, Claim 18 has been canceled and its allowable subject matter has been incorporated into Claim 17. Consequently, Applicants submit that Claim 17 is now allowable.

The Office Action rejected Claims 1, 2, 8, and 19-21 under 35 U.S.C. § 102(b) as being anticipated by European Patent Application 0 300 743 (Lin et al.). The Office Action rejected Claims 3, 9-13, 15, 16, and 22 under 35 U.S.C. § 103(a) as being unpatentable over Lin et al. in view of U.S. Patent No. 6,273,550 (Brown); Claims 4-7 and 14 as being unpatentable over Lin et al. in view of Brown and further in view of U.S. Patent No. 6,302,508 (Asauchi et al.); and Claim 17 as being unpatentable over Brown in view of Asauchi et al. Applicants respectfully traverse these rejections.

Initially, Applicants note (as mentioned above) that the allowable subject matter of Claim 18 has been incorporated into Claim 17. Consequently, Applicants submit

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that Claim 17 is now allowable.

Applicants submit that amended independent claims 1, 19, and 21, together with the remaining claims dependent thereon, are patentably distinct from Lin et al. at least for the following reasons.

The aspect of the present invention set forth in Claim 1 is a printing apparatus for forming a color image by applying different color inks to a printing material while bi-directionally moving the recording head to scan the recording material. The printing apparatus includes a record control means for applying ink to respective pixel areas. Each of the pixel areas are constituted only by a primary color or colors, or they're constituted only by a secondary color or colors. The record control means also controls a number of ink droplets applied to each of the pixel areas in accordance with multi-level data. A changing means of the printing apparatus changes an order of the applications of the inks to be applied for printing a secondary color to a secondary color pixel area. The apparatus also includes a forming means for forming the secondary color while making the order of applications of the inks to at least one of a plurality of the secondary color pixel areas arranged along a raster scan direction different from the order of another, by the changing means.

One important feature of Claim 1 is the feature of a record control means for applying ink to the respective pixel areas, where each of the pixel areas are constituted only by a primary color or colors, or they're constituted only by a secondary color or colors. The record control means also controls a number of ink droplets applied to each of the pixel areas in accordance with multi-level data.

Lin et al., as understood by Applicants, relates to an improved spot deposition for liquid ink printing. In Lin et al., the method is directed to a problem of a bead, which is caused by the flow of the ink between adjacent pixels. In Lin et al., the

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recording is effected such that the adjacent ink spots (ink starts) are overlapped with each other by which a solid area can be printed with high-quality, but if this type of printing is carried out on a transparent film, or the like, the problem of bead arises. In order to solve this problem, Lin et al. discusses that the printed pixels are skipped in a mask pattern having a checker pattern as shown in Figures 7A and 7B, and the recording is completed by two strokes of scan (one reciprocation). In this method, the skipping positions are fixed. Therefore, when an image to be printed synchronizes with the skipping pattern as shown in Figures 7A or &B, the order of overlying of inks in a pixel, which is to receive different color inks (mixed color), is not uniform. Thus, with the structure in Lin et al., pixels with different orders of ink application occur depending on the fixed mask pattern. Nothing has been found, however, by Applicants in Lin et al. that would teach or suggest the feature of a record control means for applying ink to the respective pixel areas or for controlling a number of ink droplets applied to each of the pixel areas in accordance with multi-level data, as recited in Claim 1. In addition, nothing has been found in Lin et al. that would teach or suggest the feature of changing an order of applications of the inks to be applied for printing a secondary color to a secondary color pixel area, as recited in Claim 1.

Accordingly, Applicants submit that at least for these reasons, Claim 1 is patentable over Lin et al.

Independent Claim 21 is a method claim that includes the same feature of the record control means for applying ink to the respective pixel areas and for controlling the number of ink droplets applied to each of the pixel areas in accordance with multi-level data, as discussed above in connection with Claim 1. Accordingly, Claim 21 is believed to be patentable for at least the same reasons as discussed above in connection with Claim 1.

The aspect of the present invention set forth in Claim 19 is also directed to a printing apparatus for forming a color image by application of different color inks to a

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printing material while bi-directionally moving the recording head to scan the recording material. The apparatus includes the features of a changing means and forming means that corresponds to Claim 1 above. However, the record control means in Claim 19 effects recording by controlling the ejection of the ink to each of the pixel areas by the application of a plurality of colors of inks to each of the pixel areas. Applicants submit that nothing has been found in Lin et al. that would teach or suggest the record control means, as recited in Claim 19, and at least for this reason, Claim 19 is patentable over Lin et al.

A review of the other art of record including Brown and Asauchi et al. has failed to reveal anything that, in Applicants' opinion, would remedy the deficiencies of the art discussed above, as applied against the independent claims herein. Therefore, those claims are respectfully submitted to be patentable over the art of record.

The other rejected claims in this application depend from one or another of the independent claims discussed above, and, therefore, are submitted to be patentable for at least the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, individual reconsideration of the patentability of each claim on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable reconsideration and early passage to issue of the present application.

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Applicants' undersigned attorney may be reached in our New York Office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address listed below.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES TO CLAIMS (as of 12/17/02)

1. (Amended) A printing apparatus for forming a color image by applying different color inks to a printing material while bi-directionally moving the recording head to scan the recording material, said apparatus comprising:

a record control means for applying ink to respective pixel areas, each of said pixel areas being constituted only by a primary color or colors or constituted only by a secondary color or colors, and for controlling a number of ink droplets applied to each of said pixel areas in accordance with multi-level data;

a changing means for changing an order of applications of the inks to be applied for printing a secondary color to a secondary color pixel area; and

a forming means for forming the secondary color while making the order of applications of the inks to at least one of a plurality of the secondary color pixel areas arranged along a raster scan direction different from the order of another, by said changing means.

2. (Amended) [An] The apparatus according to Claim 1, wherein said forming means forms the secondary color while changing by said changing means the order for substantially half the number of the secondary color pixel areas arranged along the raster one direction.

3. (Amended) [An] The apparatus according to Claim 1, wherein said recording head includes one or more sets of recording elements for application of the color ink,

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the recording elements constituting the set being arranged in the scanning direction symmetrically, and said changing means selects one of the recording elements constituting the set to make the order of applications of the inks to the pixel area different from the order of another.

4. (Amended) [An] The apparatus according to Claim 3, wherein said changing means includes print buffers for the recording elements disposed symmetrically, which selectively store print data for applying the ink from [a] corresponding recording elements to change the order of applications of the inks to at least one of the secondary color pixel areas arranged in each raster line.

5. (Amended) [An] The apparatus according to Claim 4, wherein said forming means distributes the print data to the print buffers on the basis of an image signal corresponding to a color image to make the order of applications of the inks to at least one of the secondary color pixel areas arranged in each raster line different from the order of another.

6. (Amended) [An] The apparatus according to Claim 5, wherein said forming means distributes the print data randomly to the print buffers on the basis of the image signal corresponding to the color image.

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7. (Amended) [An] The apparatus according to Claim 5, wherein said forming means distributes the print data alternately to the print buffers on the basis of the image signal [correspondingly] corresponding to the color image.

8. (Amended) [An] The apparatus according to [recording element] Claim 1, wherein said recording head includes recording elements for applying different color inks arranged in the scanning direction, and said changing means changes the order of applications of the inks to the pixel areas by selecting a scanning direction of the recording head in which the ink is applied to the pixel areas.

9. (Amended) [An] The apparatus according to Claim 3, wherein the recording elements [includes at least] comprises cyan, magenta and yellow ink recording elements, and one of such recording elements is at a center of the symmetry.

10. (Amended) [An] The apparatus according to Claim 3, wherein a number of the sets is two.

11. (Amended) [An] The apparatus according to Claim 9 or 10, wherein said recording head further includes a recording element for applying black ink.

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12. (Amended) [An] The apparatus according to Claim 1, further comprising a means for applying to the secondary color pixel area a plurality of at least one of the color inks to be applied to form the secondary color to make the order of applications of the inks of said one of the color inks symmetrical to that of the other color.

13. (Amended) [An] The apparatus according to Claim 12, wherein a plurality of the other ink is applied to the pixel area.

14. (Amended) [An] The apparatus according to Claim 12, wherein centers of gravity of the dots of the different colors applied to the pixel area are substantially aligned with each other.

15. (Amended) [An] The apparatus according to Claim 12, wherein dots of inks of different colors applied to the pixel area are at least partly overlapped.

16. (Amended) [An] The apparatus according to Claim 13, wherein a plurality of the dots of the one color ink and a plurality of dots of the other color inks applied in a different order are provided in said pixel area.

17. (Amended) A printing apparatus for forming a color image by application of different color inks onto a printing material while bi-directionally moving the recording head

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to scan the printing material, said recording head having one or more sets of recording elements arranged in a scanning direction symmetrically, said apparatus comprising:

print buffers, each of said print buffers corresponding to the symmetrically arranged recording elements constituting the set; and

a distributing means for distributing print data for a color to at least one of [the] said print buffers on the basis of an image signal corresponding to the color image,

wherein said distributing means distributes the print data to either one of the print buffers when the image signal has a low level, and distributes the print data to both of the print buffers when the image signal has a high level.

19. (Amended) A printing apparatus for forming a color image by application of different color inks to a printing material while bi-directionally moving the recording head to scan the recording material, said apparatus comprising:

a record control means for effecting recording with control of ejection of the ink to each of pixel areas, said record control means effecting process color recording by application of a plurality of colors of inks to each of the pixel areas;

a changing means for changing an order of applications of inks of different colors to [formation] form a process color in a process color pixel area;

a forming means for forming the process color by making an order of applications of the inks to at least [of] the secondary color pixel areas arranged in a raster one direction different from the order of another, by said changing means.

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20. (Amended) [An] The apparatus according to Claim 1 or 19, wherein the recording head ejects [he] the ink by heat.

21. (Amended) A printing method for forming a color image by application of different color inks onto a printing material while bi-directionally moving the recording head to scan the printing material, said method comprising:

a recording step, of applying ink to respective pixel areas, each of which is constituted only by a primary color or colors or constituted only by a secondary color or colors, and for controlling numbers of ink droplets applied to each of said pixel areas in accordance with multi-level data;

a first step of application, of different color inks to form a secondary color in a secondary color pixel area in an order of applications; and

a second step of application, of different color inks to form the secondary color in the secondary color pixel area in an order of applications which is different from the order in [the] said first step of application[;].

22. (Amended) [A] The method according to Claim 21, wherein the recording head includes two sets of recording elements for application of the color ink, the recording elements constituting the set being arranged in the scanning direction symmetrically, and said first step and said second step are carried out through one scanning motion of the recording head.

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25. (Amended) [An] The apparatus according to Claim 1, wherein said apparatus is incorporated in a copying machine having a scanner effecting the scan.

26. (Amended) [An] The apparatus according to Claim 1, wherein said apparatus is incorporated in a facsimile machine having a data sending and receiving device.

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